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A new genus and species of Lophioneuridae from Burmese amber (Thripida (=Thysanoptera): Lophioneurina)

V. V. ZHERIKHIN
Arthropod Laboratory, Paleontological Institute, Russian Academy of Sciences, Profsoyuznaya Str. 123, Moscow 117647, Russia

SYNOPSIS. *Burmacypha longicornis*, gen. et sp. nov., is described and placed in the subfamily Lophioneurinae within the family Lophioneuridae (Thysanoptera =Thripida). *Burmacypha* has unusual wing venation but seems to be related to the Cretaceous genera *Undacypha* and *Jantardachus*. It represents a Mesozoic element in the Burmese amber fauna.

INTRODUCTION

The extinct family Lophioneuridae was originally established by Tillyard (1921) in the order Homoptera; later it was transferred to Psocoptera (Tillyard, 1935) and then united with living Thysanoptera (=Thripida) (Zherikhin, 1980). Lophioneurids are synapomorphous with Thysanoptera s.str. in the short mouth cone formed by stylet-like mandibles and laciniae and elongate labium, the two-segmented tarsi with large eversible pulvilla and small claws, and the loss of outer valvulae of the ovipositor; they are more primitive in retaining the symmetrical mouthparts, antennae inserted below eyes and relatively broad wings with complete venation (Vishniakova, 1981). Lophioneuridae were long-lived and probably distributed world-wide as documented by numerous finds in the Permian of Australia, North America and Asia, as well as in the Mesozoic of Europe, Asia and Australia. Two subfamilies are recognized, Lophioneurinae and Zoropsocinae (Tillyard, 1935). The youngest lophioneurids described up to now are preserved in amber from Taymyr, Siberia (Vishniakova, 1981) which is Santonian in age. A new species from Burmese amber described below represents a new genus. The vein nomenclature below is after Vishniakova (1981).

SYSTEMATIC DESCRIPTIONS

Order **THRIPIDA**
Suborder **LOPHIONEURINA**
Family **LOPHIONEURIDAE** Tillyard, 1921
Subfamily **LOPHIONEURINAE** Tillyard, 1921
Genus ***BURMACYPHA*** nov.

TYPE SPECIES. *Burmacypha longicornis* sp. nov.; Burmese amber, probably Upper Cretaceous, Hukawng Valley, Myanmar (Burma).

DIAGNOSIS. A genus of Lophioneurinae with forewings sclerotized, membrane distinctly cellulate; Sc present, R, M and Cu fused forming long common stem, then R+M and Cu diverge and connect again before apex forming large discal cell. A completely reduced hindwing lacking IR, posterior branch of RS fork ending well behind wing apex, M perpendicular to R+M stem.

Burmacypha longicornis gen. & sp. nov. Figs 1–3

HOLOTYPE. NHM Pal. Dept. In.20194. Inclusion in Burmese amber, probably Upper Cretaceous, Hukawng Valley, Myanmar (Burma), (see Zherikhin & Ross, this volume).

DIAGNOSIS. Species of *Burmacypha* with forewing length 0.75 mm.

DESCRIPTION. Antennae 7-segmented, long, exerted just before eyes, clearly longer than midlength of forewing; scape and pedicel cylindrical, distinctly longer than broad, flagellum very slender, filiform, without distinct pubescence. Eyes round, convex, coarsely facetted. Clypeal area short. Mouth cone elongate, longer than head, symmetrical. Labrum long, convex in lateral view. Labial palpi long, slender, with first 3 segments subequal, much longer than broad; 4th segment as long as 2nd and 3rd combined, widened, pyriform. Structure of stylets unknown. Pronotum short, broad, raised in side view. Forewing broad, about 2.7 times as long as wide, broadly rounded apically, somewhat sclerotized, with fine, clearly cellulate bare surface, not fringed. Anterior margin nearly straight in proximal part. Forewing venation strong, bare. Sc distinct, very close to anterior margin, reaching somewhat less than 0.3 of wing length. R, M and Cu fused in basal third of wing forming a straight common stem nearly equidistant from fore and hind margin: then this vein divides into two symmetrical stems forming a large, heptagonal discal cell: R+M directed obliquely forwards from origin and Cu directed obliquely backwards from origin. After initial branching, both stems become subparallel to wing margins, and after second branching converge to point of origin of next branch. All branches straight, their points of origin on both stems placed directly opposite each other, about 0.4, 0.6 and 0.75 of wing length. R with 3 branches projecting to anterior margin: IR directed obliquely to anterior margin and base of wing and ending near 0.3 of wing length; R_{2+3} directed sub-perpendicularly to R+M stem and ending about 0.6 of wing length; R_{4+5} directed obliquely to anterior margin and apex and ending about 0.85 of wing length. M divided from R+M at point of origin of R_{4+5}, directed transversally with two branches, anterior and almost opposite R_{4+5}, posterior directed obliquely backwards and joining CuA. Cu stem with two branches; CuA perpendicular to stem and CuP connected with posterior M branch. Anal veins absent. Hindwing membranous, transparent, narrow, about as long as forewing and 4.4 times as long as wide, with anterior margin distinctly sinuate and hind margin convex, lacking fringe, with numerous microtrichiae throughout. Veins weak, colourless. Sc absent. R+M forming long common stem. M simple, originating about 0.6 of wing length, perpendicular to R+M stem, ending at the same level at hind margin. R forming large and short fork apically and ending

Fig. 1 *Burmacypha longicornis* gen. et sp. nov. Holotype, In.20194, Burmese amber. Length of forewing 0.75 mm.

Fig. 2 *Burmacypha longicornis* gen. et sp. nov. Holotype, In.20194, Burmese amber.

symmetrically at either side of wing apex. Cu straight, simple, reaching hind margin about 0.35 of wing length. Abdomen not reaching wing apex, segmentation indistinct. Coxae large, conical. Legs long, slender; femora cylindrical, about as long as tibiae; tarsi about half as long as tibiae, with 1st segment very short, 2nd much longer than broad; large apical pulvilla present; claws very small. Dimensions: forewing length 0.75 mm, width 0.35 mm, antenna length about 0.55 mm, hind tibia length 0.20 mm.

REMARKS. The position of the insect inside the amber piece make the precise measurement of many structures impossible, so that some relations in the above description are indicated as approximate only.

DISCUSSION. At first glance, *Burmacypha* seems to be very unusual, especially in respect of the forewing venation; however, similar evolutionary trends occur in some previously described genera, especially in *Undacypha* Vishniakova (from Unda, Transbaikalia-Lower Cretaceous) and *Jantardachus* Vishniakova (from Siberian amber- Santonian). The homology of the forewing venation accepted here may be disputable on some points; however, this is the most simple homology, not requiring a hypothesis about the appearance of any 'new' veins absent in other lophioneurids.

The genus is placed in the subfamily Lophioneurinae because of the following features combined: the wings lack a marginal setose fringe; the veins are bare; Cu base in forewings fused with M+R; and M in the hind wings is simple.

Burmacypha is certainly a highly apomorphous genus with many derived characters. However, few of them are synapomorphous with other genera, namely the 7-segmented antennae (shared with other Mesozoic genera of Lophioneurinae), the short and raised pronotum (shared with *Undacypha*), the terminal segment of the labial palpi enlarged (shared with *Jantardachus*), and IR in the hind wings lost (shared with both *Undacypha* and *Jantardachus*). Much more derived characters are unique for *Burmacypha*: the forewing is broad, sclerotized, with a distinctly cellulate surface; R, M and Cu in the forewing are fused for a long distance; the forewing has a peculiar discal cell closed apically by the transversally turned median vein; the arrangement of the veins around the discal cell remarkably symmetrical; the hindwing has the anterior margin angularly sinuate; M in the hind wing is perpendicular to the R+M common stem; the 1st tarsal segment is very short. The long antennae should also be listed here. Though long antennae are plesiomorphous in Lophioneuridae in general, in this primitive state they are at least 10-segmented. In the majority of Mesozoic genera the number of antennal segments is reduced, and antennae shortened, and the 7-segmented antennae in *Burmacypha* are almost certainly secondarily long. The long mouth cone may also be apomorphous but it is difficult to compare it in detail with those of *Undacypha* which is somewhat similar at least superficially. On the other hand, *Undacypha* and *Jantardachus* are synapomorphous in the reduction of Sc in the forewings while in *Burmacypha* Sc is long as in the Palaeozoic lophioneurine genera and the Upper Jurassic genus *Karataocypha* Vishniakova. The long and slender legs of *Burmacypha* may be plesiomorphous. A similar state occurs in *Undacypha* whereas the shortened legs of *Jantardachus* seem to be apomorphous; unfortunately, the leg structure is unknown in other Mesozoic Lophioneurinae.

All three lophioneurinae genera known from the Cretaceous, namely *Undacypha*, *Jantardachus* and *Burmacypha*, may be related and perhaps belong to a holophyletic unit. However, they do not seem to be very closely related to each other. Probably, only a small part of the Cretaceous lophioneurid diversity is known, and further finds will illuminate the taxonomic structure of this youngest lineage within the family.

The abdomen of the holotype of *Burmacypha longicornis* is somewhat laterally flattened and transparent, with some dark internal structures visible inside. The internal anatomy of lophioneurids is unknown, and the specimen is very interesting in this respect. Unfortunately, it is difficult to interpret the internal structures

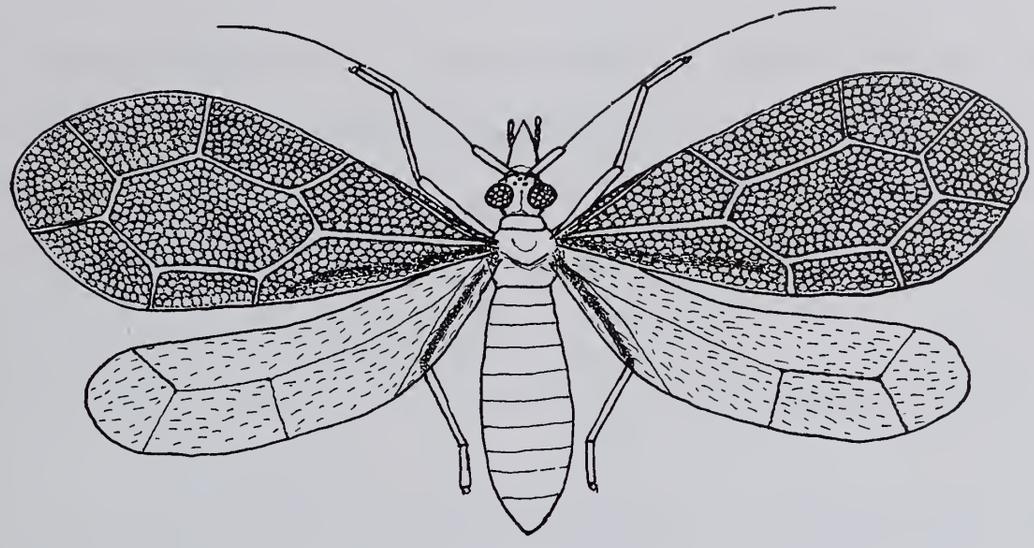

Fig. 3 *Burmacypha longicornis* gen. et sp. nov. Reconstruction.

accurately. Evidently there appears to be the alimentary tract filled by a dark substance. It seems to be large and forming loop(s) which looks like a large dark mass of unregular shape. Three long appendices originating from this dark mass dorsally may represent either the gastral caecae or the Malpighian tubes. Perhaps some internal genital structures are also visible but I have failed to interprete them. There are no traces of the ovipositor which is well observable in other lophioneurids as well as in the less advanced families of the true thrips; this indicates the specimen is most probably a male.

The elongate lophioneurid mouthparts forming a cone indicate that like modern primitive thrips, lophioneurids were adapted to the sucking up of individual small objects such as pollen grains, small soft-bodied animals and insect eggs (Zherikhin, 1980). In *Burmacypha* the mouth cone is comparatively long assuming a rather advanced trophic specialisation.

No lophioneurids have been found in the Cenozoic, and *Burmacypha* certainly represents a Cretaceous element in the Burmese amber fauna. Its zoogeographic relationships are uncertain. In the Early Cretaceous the forms related to *Burmacypha* were probably distributed very widely if *Edgariekia* Jell & Duncan from the Lower Cretaceous of Australia is indeed synonymous with Siberian *Undacypha* as claimed by Ansorge (1996). As stated above *Burmacypha* seems to be not closely related to Siberian *Jantardachus*, the only Late Cretaceous genus known.

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